Redefining the tomographic data collection and processing at the ESRF

Nicola Viganò, Peter Cloetens, Marco Di Michiel, Alexander Rack, Paul Tafforeau

The ESRF tomography acquisition and processing software’s fragmentation across the different beamlines resulted in high maintenance and development costs, which have severely hindered its progress. We are currently re-thinking the acquisition and processing workflows from scratch, to deliver a unified solution to the tomography beamlines. This will result in a uniform and standardized experience, with high quality modular software.

Introduction
The ESRF tomography acquisition and processing software has traditionally suffered from fragmentation across the different beamlines, resulting in many different solutions for similar problems. The associated maintenance and development costs have severely hindered its progress.

The tomo-bridge is the current effort in re-thinking ESRF’s acquisition and processing workflows from scratch, with a unified solution across the board. The centralization of the development is expected to deliver a uniform and standardized experience on all the ESRF tomography beamlines, and to provide high quality software.

Unified acquisition
The ESRF is currently changing its acquisition system, moving from the ageing SPEC to a new system called Bliss. Bliss is developed in-house and it is python based. It offers modern functionality and integration with modern tools that were not available with SPEC.

On top of this effort, we are developing a unified acquisition solution for all tomography scans, ranging from full-field X-ray phase-contrast acquisition, to pencil-beam X-ray Fluorescence and X-ray Diffraction acquisition.

Common data format
The data acquired on all the tomography beamlines will be saved in the NeXus NXtomo data format. Nxctomo is a public data format definition, aimed at facilitating the exchange of data. Each different technique will implement a slightly different variation, which satisfies the specific needs of the technique.

Design of workflows
The design of data processing workflows will be aided by intuitive graphical user interfaces (GUIs). They will aid the assembling and configuration of sequences and parameters of the processing steps. Different reconstruction techniques will have dedicated processing tools / steps.

These GUIs will also allow one to launch and monitor sequences of reconstructions (for multiple scans with same parameters) on the computing cluster of the ESRF.

Modular processing software
The tomographic data processing software is being developed with a modular design, which will enable the following aspects: (a) gradual migration of the existing workflows to the system; (b) atomic and direct comparison and validation of the new tools with the existing ones; (c) easy development of new processing steps by the beamline scientists; (d) development of third-party plug-ins by ESRF partners.

The authors constitute the tomo-bridge steering panel, which is in charge of defining the development and strategic directions of the ESRF tomographic software (for both acquisition and processing). The tomo-bridge relies on the work and competence of the supporting groups in the ISDD: BCU and DAU.